REMARKS

Claims 1 and 4 have been amended. No new matter has been added. Support for the claim amendments may be found, for example, at page 4, lines 5-15 of the specification.

Claims 1-6 are pending.

Applicants thank the Examiner for withdrawing the previous claim objections and claim rejections under 35 U.S.C. § 112.

CLAIM REJECTIONS

Rejection under 35 U.S.C. § 103

Keough and Zhu

The Examiner has maintained the rejection of claims 1-3 under 35 U.S.C. § 103(a) as being unpatentable over Keough (*Anal. Chem.*, Vol. 54, p. 2540-2547 (1982)) ("Keough") and further in view of Zhu et al. (*Int J Mass Spectrom.*, Vol. 194, p. 93-101 (2000)) ("Zhu"). See Office Action at p. 2. Claims 2-3 depend from independent claim 1.

To be an effective chemical ionization source for SIFT-MS, the ion that is used **must not** react with the major components of air, i.e. O_2, N_2, CO_2 or Ar. In addition, the ion **must not** react with simple hydrocarbons. Finally, the ion **must react** with sulfur containing molecules like odorants that are added to hydrocarbons. When all of the above conditions are met, then and only then is there an effective method for monitoring odorant in hydrocarbons. See, for example, p. 5, line 13 to p. 6, line 2 of the specification.

Applicants have amended claim 1 to clarify that method of detecting and quantifying trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne includes using an alkoxyalkyl cation as the chemical ionization precursor in a selected ion flow tube mass spectrometer wherein the chemical ionization precursor does not react with the major components of air, nor with the gas or the gas mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

None of the above-cited references, alone or in combination, describe that the chemical ionization precursor does not react with the major components of air, nor with the gas or the gas

mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

Keough uses electron bombardment on diethyl ether to generate methoxy methyl cation and reported reactions with large hydrocarbons. See abstract of Keough. Specifically, Keough uses the ion generated $C_2H_5O^+$ and $C_2H_7O^+$ as chemical ionization agents to distinguish between a number of different hydrocarbons including for example, alkenes and cycloalkenes, conjugated and non-conjugated dienes. See abstract on p. 2540 of Keough. In contrast, claim 1 describes using alkoxyalkyl cation as the chemical ionization precursor because it **does not react** with small saturated hydrocarbons. See for example, Table 1 on p. 4 of the specification. As such, Keough does not teach or suggest a method of detecting and quantifying trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne, the method including using an alkoxyalkyl cation as the chemical ionization precursor in a selected ion flow tube mass spectrometer wherein the chemical ionization precursor does not react with the major components of air, nor with the gas or the gas mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

Such a defect is not remedied in Zhu. Zhu describes "a method of analyzing a gas sample using selected ion flow tube mass spectroscopy ... using dimethyl ether as the chemical ionization precursor." See Office Action at p. 3. Zhu only examined three reactions of amines that are irrelevant to the pending claims. See Abstract of Zhu. Zhu does not teach or suggest a method of detecting and quantifying trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne, the method including using an alkoxyalkyl cation as the chemical ionization precursor in a selected ion flow tube mass spectrometer wherein the chemical ionization precursor does not react with the major components of air, nor with the gas or the gas mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

There is no motivation or suggestion in either Keough or Zhu to modify the methods described in both references to arrive at the method described in claim 1. In fact, Keough teaches away from the method described in claim 1 as Keough describes reactions of methoxy methyl cation with large hydrocarbons. See abstract of Keough. Accordingly, none of the

above-mentioned references, alone or in combination, teach or suggest a method of detecting and quantifying trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne, the method including using an alkoxyalkyl cation as the chemical ionisation precursor in a selected ion flow tube mass spectrometer wherein the chemical ionization precursor does not react with the major components of air, nor with the gas or the gas mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

Since claims 2-3 depend on claim 1, claims 2-3 are also patentable over the combination of Keough and Zhu for at least the reasons described above. Applicants respectfully request reconsideration and withdrawal of this rejection

Keough in view of Zhu and Freitas

The Examiner has maintained the rejection of claims 4-6 under 35 U.S.C. § 103(a) as being unpatentable over Keough in view of Zhu and further in view of Freitas et al. (*Int J Mass Spectrom.*, Vol. 175, p. 107-122 (1998)) ("Freitas"). See Office Action at p. 4. Claims 5-6 depend from independent claim 4.

Amended claim 4 relates to a method of detecting and quantifying a gas sample containing trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne in a selected ion flow tube mass spectrometer that include the steps of: producing a supply of alkyoxymethyl cations, mass selecting the alkyoxymethyl cations, inducing a flow of the alkyoxymethyl cations into the inlet of a flow tube of the spectrometer in a carrier flow of helium reacting the gas sample with the alkyoxymethyl cations, analysing the reacted gas sample in the mass spectrometer, and calculating the concentration of the trace levels of molecules containing heteroatoms present in the reacted gas sample wherein the alkyoxymethyl cations do not react with the major components of air, nor with the gas or the gas mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

As previously explained, Keough uses $C_2H_5O^+$ and $C_2H_7O^+$ as chemical ionization agents to distinguish between a number of different hydrocarbons including for example, alkenes and cycloalkenes, conjugated and non-conjugated dienes. See abstract on p. 2540 of Keough. In

contrast, claim 4 describes using alkyoxymethyl cations as the chemical ionization precursor because it **does not react** with small saturated hydrocarbons. See for example, Table 1 on p. 4 of the specification. As such, Keough does not teach or suggest a method of detecting and quantifying a gas sample containing trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne in a selected ion flow tube mass spectrometer that include reacting the gas sample with the alkyoxymethyl cations, analysing the reacted gas sample in the mass spectrometer, and calculating the concentration of the trace levels of molecules containing heteroatoms present in the reacted gas sample wherein the alkyoxymethyl cations do not react with the major components of air, nor with the gas or the gas mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

Such a defect is not remedied in Zhu or Freitas either. Zhu describes "a method of analyzing a gas sample using selected ion flow tube mass spectroscopy ... using dimethyl ether as the chemical ionization precursor." See Office Action at p. 5. Zhu does not teach or suggest a method of detecting and quantifying a gas sample containing trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne in a selected ion flow tube mass spectrometer that include reacting the gas sample with the alkyoxymethyl cations, analysing the reacted gas sample in the mass spectrometer, and calculating the concentration of the trace levels of molecules containing heteroatoms present in the reacted gas sample wherein the alkyoxymethyl cations do not react with the major components of air, nor with the gas or the gas mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

Freitas describes the "gas phase reactivity of the methoxymethyl cation ... towards 21 neutral nucleophiles ...." See abstract of Freitas. Freitas does not teach or suggest a method of detecting and quantifying a gas sample containing trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne in a selected ion flow tube mass spectrometer that include reacting the gas sample with the alkyoxymethyl cations, analysing the reacted gas sample in the mass spectrometer, and calculating the concentration of the trace levels of molecules containing heteroatoms present in the reacted gas sample wherein the alkyoxymethyl cations do not react with the major

components of air, nor with the gas or the gas mixtures containing alkanes, ethene or ethyne but reacts with the trace levels of molecules to be detected.

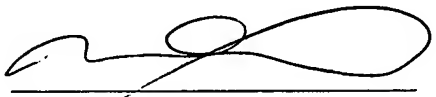
There is no motivation or suggestion in Keough, Zhu or Freitas to modify the methods described in the above-cited references to arrive at the method described in claim 4. Accordingly, none of the above-mentioned references, alone or in combination, teach or suggest a method of detecting and quantifying a gas sample containing trace levels of molecules containing one or more of a range of reactive species in gases or gas mixtures containing alkanes, ethene, or ethyne in a selected ion flow tube mass spectrometer that include reacting the gas sample with the alkyoxymethyl cations, analysing the reacted gas sample in the mass spectrometer, and calculating the concentration of the trace levels of molecules containing heteroatoms present in the reacted gas sample.

Since claims 5-6 depend on claim 4, claims 5-6 are also patentable over the combination of Keough, Zhu and Freitas for at least the reasons described above. Applicants respectfully request reconsideration and withdrawal of this rejection

CONCLUSION

Applicant believes that the claims are in condition for allowance. Should any fees be required by the present Reply, the Commissioner is hereby authorized to charge Deposit Account 19-4293.

Respectfully submitted,



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